FOREST RESEARCH DIGEST

AUGUST 1935

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LAKE STATES FOREST EXPERIMENT STATION*

Forest Service U. S. Dept. Agr.

THE SHELTERBELT PROJECT

On Tuesday, July 30, Mr. Zon addressed the Rotary Club of Milwaukee, taking as his subject the Great Plains Shelterbelt Project. He discussed the results of the extensive research which has been carried out for the purpose of supplying a groundwork of facts on which the plans for actual planting of the shelterbelts can be built. This research clearly demonstrated that shelterbelt planting can be done successfully if the proper skill and care is used in planning and executing the work.

It was pointed out that even though the influence of shelterbelts on the climate of the region as a whole is problematical, their effect on conditions in the immediate vicinity of the trees is well recognized. Emphasis was placed on the fact that the planting of shelterbelts is only a phase in a long-time program for the rehabilitation of the Plains Region. Taking certain lands out of cultivation and returning them to grass, development of soil binding grasses, introduction of drought resistant strains of crops, and control of erosion are some of the other features of the program.

Mr. Zon particularly stressed the economic and social aspects of the project. He pointed out that the considerable population of the region included within the boundaries of the project is in need of protection from the extremes of climatic fluctuations if that population is to become stabilized. Stability of population is of vital importance to the welfare of a nation. When

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*Maintained in cooperation with the University of Minnesota at University Farm, St. Paul, Minnesota.

towns and villages spring up over night only to fall into ruin as the natural resources or the temporarily favorable climatic conditions which engendered them are exhausted, the country as a whole suffers an economic and a social loss.

In order that the farmers of the Great Plains may build a permanent agricultural society, some help must be given them. They have the will but not the "wherewithal". They have suffered greatly during the past few years both physically and economically.

The planting of shelterbelts in this Region by the Federal Government will afford much needed work, the fruits of which will be enjoyed increasingly as time passes.

CONDITION OF MINNESOTA FORESTS

The Forest Survey has completed its work in Minnesota and much important information about the volume, growth, types, and rate of depletion of the forests of the state has been collected and tabulated.

The chart on the opposite page shows the present condition of Minnesota's original forests. The original type is given in the left hand column and the area of these types is indicated by the number of symbols opposite each type. Each symbol represents 250,000 acres. The present condition of the types is shown by the different character of the symbols.

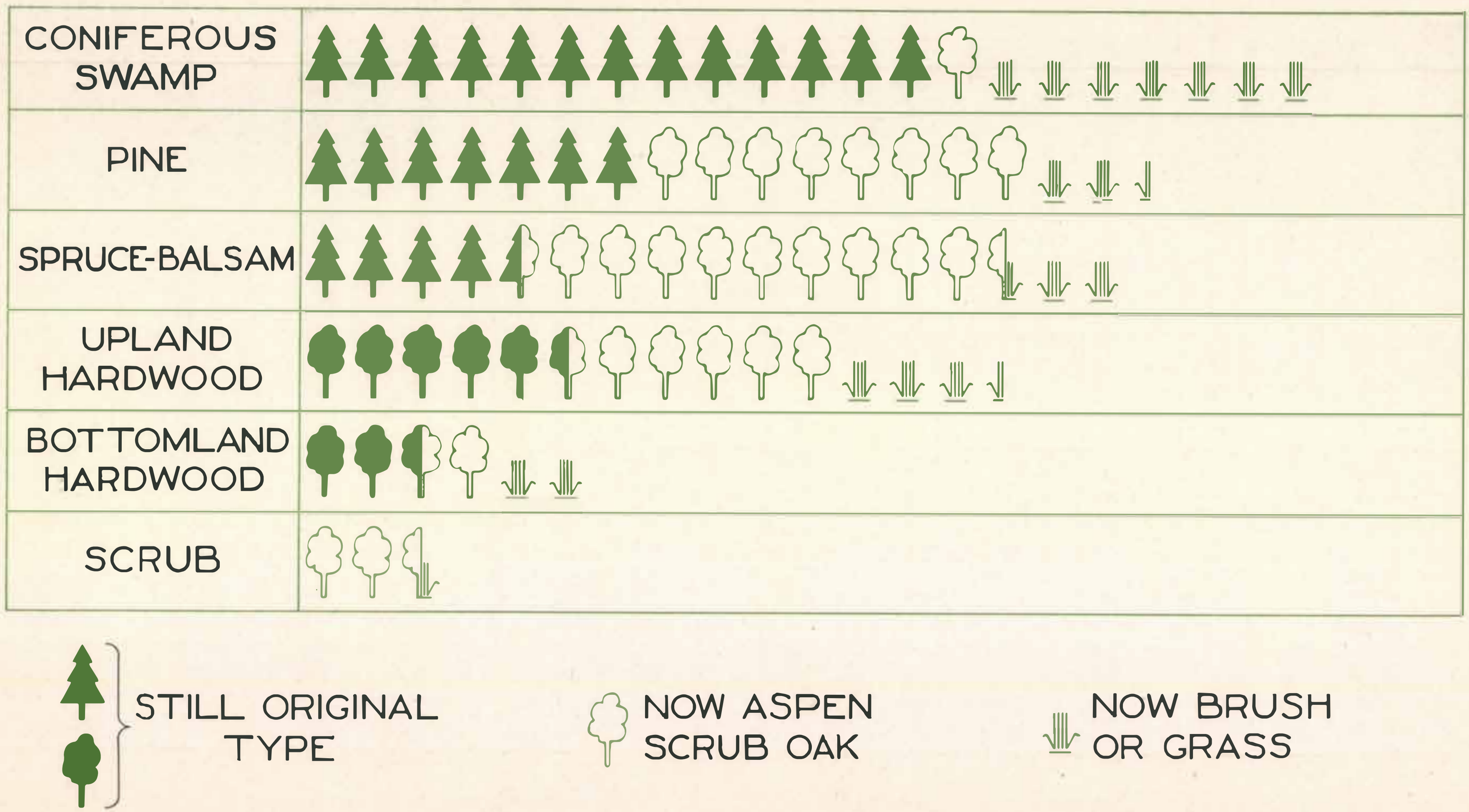
Considering all types together, two-fifths of the present forest covered area of Minnesota is occupied by the original forest type - the other three-fifths has been taken over by aspen, scrub oak, brush, or other inferior cover. The areas of the pine and spruce-balsam types have been most reduced, while the coniferous swamps have been the least seriously affected.

INJURY TO PLANTING STOCK FROM EXPOSURE

During large-scale forest planting operations the roots of planting stock of necessity must be left without protective covering for varying lengths of time. No exact limit can be set on the length of time during which such exposure can be safely permitted. However, an experiment conducted at the Lake States Station by H. L. Shirley and L. J. Meuli gives

CHARACTER OF COVER ON REMAINING FOREST AREA

EACH COMPLETE SYMBOL = 250,000 ACRES



some indication of the need for keeping the period of exposure to a minimum.

Transplants of 1-1 Norway pine, white pine, jack pine, and 2-0 white spruce seedlings were used in the experiment. The plants were placed in a drought machine with their roots entirely exposed, and allowed to remain for varying periods ranging from 5 minutes to 9 hours. The air temperature, relative humidity, and light intensity in this machine were artificially maintained within comparatively narrow limits and were undoubtedly more severe than those encountered in the field. The constancy of the factors involved, however, permitted accurate comparison of the time of exposure with the degree of injury to the several species tested.

The following atmospheric conditions were maintained: air temperature 96.0° F.; relative humidity 20.7 percent; and wind velocity 3.7 miles per hour. After exposure in the machine, the seedlings were "heeled in" in the greenhouse for approximately a month before the final observations on the degree of injury were made. A set of unexposed seedlings ~~were~~ was also "heeled in" so that it was possible to be certain that any injury was due to the exposure and not to "heeling in."

Even 10-minute exposures resulted in slight injury to all species studied, although it is likely that these seedlings would have recovered since only the tips of the secondary roots were killed and some new root growth took place during the storage period in the greenhouse. Exposures of 15 minutes and longer resulted in such severe injury to the roots of Norway pine and white spruce that it is very questionable that the plants could have survived if planted in the field. White pine was not severely injured until exposed for one hour and jack pine showed serious injury only after two hours. Exposure for 6 hours was fatal to all species except jack pine which required 8 hours exposure for complete killing. White pine produced more new root growth than any of the other species in all exposures up to one hour. White spruce was the poorest in all respects, probably due to the fibrous character of its roots which caused them to dry rapidly. Overcrowding in the seed bed may have been another factor in the poor showing of this species. All the control plants remained vigorous.

In considering the application of this experiment to field practice allowance must be made for the greater severity of

the artificial conditions. The experiment definitely indicates that a decided effort should be made to reduce the length of time that the roots are exposed to the atmosphere if serious injury to planting stock is to be avoided.

WIND DAMAGE ON THE SUPERIOR

On July 3, a short but very severe windstorm struck the Kawishiwi Experimental Forest, located near Ely, Minnesota, within the Superior National Forest. A considerable number of trees were uprooted or broken off. The greatest amount of damage occurred along newly-opened up roads and in a black spruce cutting area.

Many trees, which had been weakened by a previous storm of equal intensity but of longer duration, were blown down, and numerous others in addition. The loss in a spruce cutting area amounted to 3.8% by volume. The most severe loss was along the east edge of a clear-cutting where the trees were entirely unprotected. Selection cutting areas were not badly damaged.

The jack pine cutting experiments showed the same general results: considerable damage in the heavily cut areas and around their edges, but only slight losses in the lighter cuttings.

Judging from the damage done by these storms it would seem that partial cuttings in spruce and jack pine in areas subject to severe windstorms should be held to 40-50% of the volume, if wind damage is to be avoided.

REFORESTATION BY AIRPLANE

A report in "Science News Letters" for July 27, 1935, states that certain inaccessible areas in the Hawaiian Islands have been successfully reforested by seed sown from airplanes. Forest fires have devastated areas in the precipitous volcanic mountains and the seeds of several tree species were scattered from airplanes over a number of these areas. It was impossible to determine how successful this "planting" was for a number of years. However, the trees are now large enough to be plainly visible from a considerable distance, the African tulip trees with their scarlet flowers being especially noticeable. Moreton fig and hutu have also been planted in this manner.

SEED TREATMENTS FOR SHELTERBELT SPECIES

The plans for the Great Plains Shelterbelt Project call for the planting of a number of tree and shrub species which heretofore have not been extensively propagated in nurseries. A number of these species have seeds which are difficult to germinate. Some form of cold storage or chemical treatment which will hasten and increase germination can usually be found. Treatments for some of the species have been worked out at the Lake States Station and are presented here.

In the case of hardy catalpa (*Catalpa speciosa*) it was found that dry storage at 10°C for 2 months gave 64% germination while all other treatments such as water soaking or removal of seed coats gave less than 36%. A closely related shrub, desert willow (*Chilopsis linearis*) followed the same general trend.

Russian mulberry (*Morus alba tartarica*), a seed possessing both embryo dormancy and an impermeable seed coat, gave 80% germination when stratified in moist sand at 5°C for two months. Only 20% of the untreated seeds germinated. Russian olive (*Elaeagnus angustifolia*), a seed having seed coat dormancy only, germinated to the extent of 78% when stratified at 5°C for three months as against 38% when untreated.

By soaking seeds of Osage orange (*Maclura pomifer~~um~~a*) in cold water for 5 days 90% germinated while the best germination obtained with untreated seeds was 52%. With green ash (*Fraxinus pennsylvania lanceolata*) stratified at 5°C for 3 months, 45% germination was obtained. In some cases 2 months stratification at the same temperature was as effective. Twelve percent germination was obtained with water soaked seeds compared with 3% for untreated seeds.

Hackberry (*Celtis occidentalis*) gave 84% germination when soaked in concentrated sulphuric acid for two hours, washed and then soaked another 2 hours in the acid. This treatment renders the impermeable seed coat permeable to water. Gaseous treatments with butylene, ethylene, amylene, propylene-chloro-hydrin and ethylene-chloro-hydrin and stratification for varying periods of time gave germinations up to 55%. From 10% to 40% germination was obtained for untreated seeds.

In the case of Chittam wood (*Bumelia lanuginosa*), a seed with neither seed coat nor embryo dormancy, it was found that approximately 40% of the untreated seeds and an equal percentage

of the stratified seeds germinated. Soaking in concentrated sulphuric acid for 20 minutes, however, increased the germination to 74%.

The impermeable seed coat of the Kentucky coffee tree (*Gymnocladus dioica*) was made permeable by a 4 hour treatment with sulphuric acid giving 89% germination as against 7% germination in untreated seeds. Soapberry (*Sapindus drummondii*), another species in which seed coat dormancy exists, gave 54% germination after a 2 hour treatment with sulphuric acid; 4 hour treatments were less effective and untreated seeds gave but 4% germination.

TENT CATERPILLAR INFESTATIONS

For the third successive year, serious infestations of forest tent caterpillars have occurred on the Superior National Forest. This year thousands of acres have been defoliated by these insects. Aspen is the first species attacked but usually only a short time is required for the caterpillars completely to strip this species after which they attack others. Paper birch, hazel, alder and blueberry are eaten in the order named. After the exhaustion of the broadleaf food supply, a few caterpillars have been found feeding on conifers, tamarack, balsam fir and spruce being attacked.

At the Kawishiwi Branch Station near Ely, Minnesota, an examination of a number of cocoons disclosed the fact that large numbers of the caterpillars had been destroyed by a parasite. Some had died before completing the cocoon; others had succumbed apparently after going into the pupal stage. However, in the opinion of Entomologist L. W. Orr, the caterpillars are present in such large numbers that it is extremely doubtful that the epidemic will be checked immediately by these parasites.

EFFECT OF PRUNING ON HEIGHT GROWTH

Pruning young pines for the purpose of improving the quality of the lumber they will eventually produce has caused considerable speculation about the effect of this treatment on growth. An experiment in a 17-year-old Norway pine plantation at Birch Lake on the Superior National Forest throws

some light on this question. The trees, about 21 feet high, were pruned in February 1934. Since the average height to which the limbs were removed was about 10 feet, the pruning was fairly severe. The lowest limbs were just beginning to die when pruned. A part of the stand was left untreated for comparison.

The height growth for each of the past four years was measured in July of this year under the direction of R. K. LeBarron. The measurements were made on 50 pruned and 50 unpruned trees in the dominant and co-dominant crown classes. When the average height growth for each group was computed, it was found that pruning had had no effect on the height growth for the two years following treatment. Insufficient time has elapsed to be able to determine diameter growth. The table shows the height growth in feet for two years before and two years after pruning.

	Pruned Trees		Unpruned Trees	
Year	Total Height	Current Growth	Total Height	Current Growth
	Feet	Feet	Feet	Feet
1931	16.8		17.3	
1932	18.7	1.9	19.3	2.0
1933	20.7	2.0	21.2	1.9
Time of Pruning (17 years after planting)				
1934	22.6	1.9	23.1	1.9
1935	24.5	1.9	25.0	1.9

Apparently the lower portions of the crowns were manufacturing little more food than they needed to maintain themselves or else the upper portions increased their efficiency due to the greater supply of moisture available.